Curriculum Vitae – Abridged
Emil Mihai Constantinescu

Address: Argonne National Laboratory
Mathematics and Computer Science Division
9700 S Cass Avenue,
Argonne, IL 60439, USA

E-mail: emconsta@mcs.anl.gov

Phone: 312-371-8887

Education

Doctor of Philosophy, Computer Science, May 2008
Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA
Dissertation: Adaptive numerical methods for large scale simulations and data assimilation
Advisor: Prof. Adrian Sandu

Master of Science, College of Automatic Controls and Computers, June 2002
Bucharest Polytechnic University, Romania

Bachelor of Science, College of Automatic Controls and Computers, June 2001
Bucharest Polytechnic University, Romania

Recent Academic/Professional Experience

2008 – present Wilkinson Fellow, **Argonne National Laboratory**, Mathematics and Computer Science Division

2003 – 2008 Graduate Research Assistant, Department of Computer Science, **Virginia Tech**

2006 (Jun-Aug) Givens Fellow, **Argonne National Laboratory**, Mathematics and Computer Science Division
- o Assisted the development of a model reduction approach to electronic density computation in large nanostructures using orbital-free density functional theory (DFT)
- o Designed an adaptive mesh framework for use in energy potential minimization
- o Performed mathematical programming (optimization) experiments with TAO

Research Interests

- ➢ **Scientific Computing and High Performance Computing** in general, and in particular:
  - ➢ **Time-stepping schemes** for ODEs/PDEs – numerical algorithms that evolve the solution in time, particular instances/properties include implicit-explicit, multirate, monotonicity preserving.
  - ➢ **Multiscale/Multiphysics Modeling and Simulation** – integration of multiple scales and physical processes in modeling and simulation.
  - ➢ **Data Assimilation, Sensitivity Analysis, and Inverse Problems** for PDEs – methods for constraining the PDE solution (PDE constrained optimization) with observations and for uncertainty quantification.
  - ➢ **Dynamic Adaptive Mesh Refinement** for reactive flow problems – issues in variable grid size for efficient PDE discretization.

Journal Publications

Emil M. Constantinescu, **On the order of general linear methods**; Applied Mathematics Letters, Vol. 22(9), pp 1425-1428, DOI: 10.1016/j.aml.2008.12.005, 2009. [Preprint # ANL/MCS-P1555-1008, Oct. 2008]

Emil M. Constantinescu, Victor M. Zavala, Matthew Rocklin, Sangmin Lee, and Mihai Anitescu, **A Computational Framework for Uncertainty Quantification and Stochastic Optimization in Unit Commitment with Wind Power Generation**; Submitted to IEEE Transactions on Power Systems, 2009. [Technical Memorandum # ANL/MCS-TM-309, Sep. 2009]

Victor Zavala, Emil M. Constantinescu, Theodore Krause, and Mihai Anitescu, **On-line economic optimization of energy systems using weather forecast information**; To appear in the Journal of Process Control, DOI: 10.1016/j.jprocont.2009.07.004, 2009. [Preprint # ANL/MCS P1588-0309, Jan 2009]

Emil M. Constantinescu and Adrian Sandu, **Optimal strong-stability-preserving general linear methods**; Submitted to SIAM Journal on Scientific Computing (SISC), 2009. [Preprint # ANL/MCS-P1584-0209, Oct. 2008]

Emil M. Constantinescu and Adrian Sandu, **Multirate timestepping methods for hyperbolic conservation laws**; Journal of Scientific Computing, Vol. 33(3), pp 239-278, DOI: 10.1007/s10915-007-9151-y, 2007.

Adrian Sandu and Emil M. Constantinescu, **Multirate explicit Adams methods for time integration of conservation laws**; Journal of Scientific Computing, DOI: 10.1007/s10915-008-9235-3, 2008.

Emil M. Constantinescu and Adrian Sandu, **Extrapolated implicit-explicit time stepping**; Submitted to SIAM Journal on Scientific Computing (SISC), 2008.

Emil M. Constantinescu, Adrian Sandu, and Gregory R. Carmichael, **Modeling atmospheric chemistry and transport with dynamic adaptive resolution**; Computational Geosciences, Vol. 12(2), pp 133-151, DOI: 10.1007/s10596-007-9065-7, 2007.

Gregory R. Carmichael, Adrian Sandu, Tianfeng Chai, Dacian N. Daescu, Emil M. Constantinescu, Youhua Tang, **Predicting air quality: Improvements through advanced methods to integrate models and measurements**; Journal of Computational Physics Review, Vol. 227(7), pp 3540-3571, DOI: 10.1016/j.jcp.2007.02.024, 2007.

Emil M. Constantinescu, Adrian Sandu, Tianfeng Chai, and Gregory R. Carmichael, **Ensemble-based chemical data assimilation I: General approach**; Quarterly Journal of the Royal Meteorological Society, Vol. 133(626), pp 1229-1243, DOI: 10.1002/qj.76, 2007.

Emil M. Constantinescu, Adrian Sandu, Tianfeng Chai, and Gregory R. Carmichael, **Ensemble-based chemical data assimilation II: Covariance localization**; Quarterly Journal of the Royal Meteorological Society, Vol. 133(626), pp 1245-1256, DOI: 10.1002/qj.77, 2007.

Emil M. Constantinescu, Adrian Sandu, Tianfeng Chai, and Gregory R. Carmichael, **Autoregressive models of background errors for chemical data assimilation**; Journal of Geophysical Research, Vol. 112, pp D12309, DOI: 10.1029/2006JD008103, 2007.

Emil M. Constantinescu, Adrian Sandu, Tianfeng Chai, and Gregory R. Carmichael, **Assessment of ensemble-based chemical data assimilation in an idealized setting**; Atmospheric Environment, Vol. 41(1), pp 18-32, DOI: 10.1016/j.atmosenv.2006.08.006, 2007.

Lin Zhang, Emil M. Constantinescu, Adrian Sandu, Youhua Tang, Tianfeng Chai, Gregory R. Carmichael, Daewon Byun, and E. Olaguer, **An adjoint sensitivity analysis and 4D-Var data assimilation study of Texas air quality**; Atmospheric Environment (special ACM issue), Vol. 42(23), pp 5787-58-4, DOI: 10.1016/j.atmosenv.2008.03.048, 2008.

Recent Conferences with Peer Reviewed Proceedings

Adrian Sandu and Emil M. Constantinescu, **Multirate time discretizations for hyperbolic partial differential equations**; Submitted to the International Conference of Numerical Analysis and Applied Mathematics 2009 (ICNAAM 2009), Crete, Greece, 18-22 September 2009.

Emil M. Constantinescu and Adrian Sandu, **Explicit time stepping methods with high stage order and monotonicity properties**; To appear in (in Lecture Notes in Computer Science) and presented at the International Conference on Computational Science (ICCS), May 25-27, 2009 Baton Rouge, Louisiana, 2009.

Adrian Sandu, Emil M. Constantinescu, Gregory R. Carmichael, Tianfeng Chai, John H. Seinfeld, and Dacian Daescu, **Localized ensemble Kalman dynamic data assimilation for atmospheric chemistry**; International Conference on Computational Science (ICCS), pp 1018-1025, 2007.

Recent Conference Presentations

Emil M. Constantinescu and Adrian Sandu, **On general linear time stepping methods**; SIAM Conference on Computational Science and Engineering (CSE09), March 2-6, Miami, FL, 2009.

Emil M. Constantinescu and Adrian Sandu, **Challenges in ensemble Kalman data assimilation for atmospheric chemical transport model**; SIAM Conference on Computational Science and Engineering (CSE09), March 2-6, Miami, FL, 2009.

Emil Constantinescu and Adrian Sandu, **Achieving very high accuracy for the time integration of multiscale processes using extrapolation methods**; Applied Mathematics Principal Investigators Meeting (AMR 08), Argonne National Laboratory October 15-17, 2008.

Emil Constantinescu and Adrian Sandu, **Multirate SSP methods for hyperbolic PDEs**; SIAM Annual Meeting (AN08), San Diego, CA, July 7-11, 2008.

Emil Constantinescu and Adrian Sandu, **Multirate numerical integration for hyperbolic conservation laws**; (invited by) The European Consortium for Mathematics in Industry (ECMI-2008), June 30 – July 4, 2008, University College London, England, 2008.

Adrian Sandu, John Linford, and Emil Constantinescu, **Computational performance of parallel air quality models**; SIAM Conference on Parallel Processing for Scientific Computing (PP08), March 12-14, Atlanta, GA, 2008.

Emil M. Constantinescu and Adrian Sandu, **Strong stability preserving multirate schemes for hyperbolic conservation laws**; SIAM Conference on Computational Science and Engineering (CSE07), February 19-23, Costa Mesa, CA, 2007.

Emil M. Constantinescu and Adrian Sandu, **Localized ensemble Kalman filter data assimilation for atmospheric chemical and transport models**; SIAM Conference on Computational Science and Engineering (CSE07), February 19-23, Costa Mesa, CA, 2007.

Selected Presentations - Invited

Implicit-explicit time stepping methods for multiphysics problem by Emil M. Constantinescu, Institute of Mathematics Applied to Geosciences Theme-of-the-Year workshop "Frontiers of Geophysical Simulation," National Center for Atmospheric Research in Boulder, Colorado, August 18-20, 2009.

Ensemble Kalman filter data assimilation for atmospheric chemistry and transport models by Emil M. Constantinescu, NASA Goddard Space Flight Center, Greenbelt, MD, Dec. 18-19, 2007.

Grant Proposals

Scalable statistical analysis of Gaussian models for petascale spatiotemporal data, DOE - Mathematics for Analysis of Petascale Data, $1,500,000 (2010-2012), proposed on May 29, 2009. PIs: Mihai Anitescu, Michael Stein, and Emil M. Constantinescu. **Awarded-active: August 2009**.

General linear time-stepping methods for large scale simulations, NSF 0830670, $270,000 (2008-2011), proposed on March 19, 2009. PI: Adrian Sandu (asandu@cs.vt.edu), senior personnel: Emil M. Constantinescu. **Awarded-active: August 2009**.

Efficient high-order time-integrators for local high-order discretization methods, Air Force Office of Scientific Research, $534,000 (2010-2012), proposed in September 2009. PIs: Francis X. Giraldo and Emil M. Constantinescu.

Novel power system operations methods for wind-powered plug-in hybrid electric vehicles, DOE - Laboratory-Directed Research and Development – Strategic Initiative, $700,000 (2010-2012) PIs: Jianhui Wang, Audun Botterud, Victor Zavala, Emil M. Constantinescu, Mihai Anitescu, and Anant Vyas. **Awarded-active: August 2009**.

Professional Service

Meeting/organizer
- Mini-symposium on **Innovative Time Integration Methods** at SIAM Conference on Computational Science and Engineering (CSE09), March 2-6, Miami, FL, 2009
- Applied mathematics principal investigators meeting (AMR 08), Argonne National Laboratory, October 15-17, 2008

Reviewer
- Journal
  - Applied Numerical Mathematics (Elsevier – IMACS Journal)
  - Monthly Weather Review
  - Journal of Geophysical Research
- Conference
  - ACM – SAC (Symposium on Applied Computing) – '09
  - SCS – HPC (High Performance Computing) – '09